JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY
VOL. 66, NO. 4, 2015

ISSN 0735-1097/$36.00
PUBLISHED BY ELSEVIER INC.
http://dx.doi.org/10.1016/j.jacc.2015.06.008

EDITOR'S PAGE

The Evolving Future of Cardiovascular Practice

Technology + Clinicians: A Means to a Better End

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In Book II of Aristotle's *Nicomachean Ethics*, the Greek philosopher famously stated that every activity aims at some end, and he further defined man's virtues as a means to the ultimate end: happiness (1). This has spawned centuries of debate over whether the end justifies the means to achieve those goals. Health care providers today are being challenged by 3 goals or objectives: to improve the delivery and experience of care, to improve the health of populations, and to reduce the per capita costs (2). If this is our prescribed "end," then technology may provide a means of achieving those goals—but not without the assistance of experienced, thoughtful, and valued clinicians.

WHY FOCUS ON CARDIOVASCULAR DISEASE GOALS?

By 2005, the total number of cardiovascular disease (CVD) deaths (mainly coronary heart disease, stroke, and rheumatic heart disease) had increased globally to 17.5 million from 14.4 million in 1990 (3). Of these, 7.6 million were attributed to coronary heart disease and 5.7 million to stroke. More than 80% of the deaths occurred in low- and middle-income countries (3). As cardiovascular (CV) specialists, we are exposed to the number 1 killer in the world, so our practices have to be changed under the new mandate to fulfill 2 of the previously mentioned goals: improve the delivery of care and the health of populations. But what about the third objective of reducing costs? The economic cost of treating these diseases is staggering. In 2010, the total costs of CVD (heart disease and stroke) in the United States were estimated to be $444 billion (4). Treatment of these diseases accounts for about $1 of every $6 spent on health care in this country, according to the Centers for Disease Control and Prevention (4). A large proportion of these costs occurs in the hospital setting. In 2003, heart disease as a first-listed diagnosis was the highest-ranked disease category for hospital discharges, representing a 31% increase over discharges in 1979 (5). In fact, an analysis of hospital discharge data for 1979 to 2003 showed sizable increases in hospitalization for major CV diseases, including coronary heart disease (16%), stroke (29%), and chronic heart failure (17%) (6). Thus, the scrutiny will only intensify on our specialty, because the stakes are very high and the need for change is great.

WHAT ARE THE MEANS TO ACHIEVE THE GOALS?

We are already experiencing a significant change in the way we deliver CV medicine. There is far more ambulatory care delivered, and this trend will continue to grow, even with patients who are post-short hospitalization and who will be monitored in their home. We will see a rise in at-home visits from care teams, with a particular reliance upon nurses and nurse practitioners.

Hospitalizations will only occur for emergent issues or for interventional procedures with a short hospital stay. Thus, there is a need for the CV specialists and health care workers to have more training in ambulatory and home-based care, as well as training on the wireless electronic systems that will be used to monitor their patients. These electronic systems will become an invaluable part of the care team, as they will monitor the vital signs of the patients and integrate the present-day data with the makeup of the individual: organ related, metabolic, genetic, and so on. However, there will need to be a

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highly trained clinician to receive these data and act on the information. Indeed, technology will not replace the need for experienced, thoughtful, and valued clinicians. Today, CV specialists must rely on patient contact, where we gather an essential behavioral and emotional understanding of the individual, which helps us in their management. We still need to understand that every individual or patient is different, and many unique factors need to be considered to achieve the optimal outcomes. We rely on our knowledge and experience, our intuitive understanding, as well as our legacy knowledge of patient care.

HOW SPECIFICALLY CAN WE ACHIEVE AND IMPLEMENT THE GOALS?

As mentioned, the roles and training of the CV specialists and other members of the health care system will significantly move toward practicing in the ambulatory and home-based setting and toward rapidly integrating evolving knowledge via continuous education through different means of communication. Specifically, the spectrum of patients that CV specialists and health care givers will treat can be outlined in a longitudinal fashion from birth to aging and within the focus of 4 layers (Figure 1): acute coronary and cerebrovascular syndromes, stable CV disease, subclinical CV disease, and health promotion. Such personnel will have the aid of predictive analytics technologies, such as Watson Health (IBM, Armonk, New York), that will be continuously gathering health-related data of individuals.

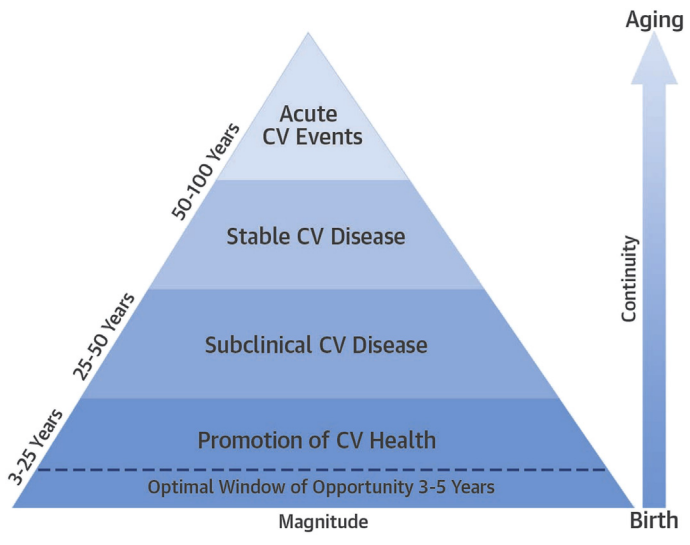

FIGURE 1 Continuity of Cardiovascular Care

Spectrum of patients that CV specialists and health care givers will treat can be outlined in a longitudinal fashion from birth to aging and within the focus of 4 layers.

IBM research indicates that the average person is likely to generate >1 million gigabytes of health-related data in a lifetime, which is the equivalent of 300 million books (7). These types of tools, along with genomics and genetics, will drive more of our effort into the health promotion stage of care, as opposed to simply treating the symptoms once they have manifested into clinical disease. It is with the assistance of these technologies in health promotion that the CV health care givers will have the greatest effect in the future, which means starting with individuals at a much younger age. In fact, our research in this area has shown that we can have the greatest effect on health from ages 3 to 6 years (8,9). From ages 20 to 50 years, the identification of subclinical disease through noninvasive and affordable imaging technology may be the main opportunity or door of entry to implement a modification of lifestyle before the disease has manifested (10,11). However, when disease does present itself, for example at ages 50 to 80 years, a combination of qualified clinicians and remote technologies will track these patients in an ambulatory setting if they have stable CV disease or in their homes after a short hospitalization for an acute coronary or cerebrovascular event. No longer will patients be hospitalized for long periods of time. This will be helpful in reducing the tremendous costs of CV disease in the in-hospital setting. It will also reduce the size of hospitals in the future. Importantly, this transition will have tremendous implications in the need for additional training in ambulatory services, which is clearly outlined in Core Cardiovascular Training Statement 4: Task Force 1, published in May 2015 in the *Journal* (12).

If we all agree that our best "end" is the triple aim of health care—to improve the delivery and experience of care, to improve the health of populations, and to reduce the per capita costs—we cannot resist the changes, or means, that are needed to achieve that end. Thoughtful, well-prepared clinicians, armed with the data generated by varied technologies, particularly wireless, will drive this change.

"Every action and pursuit is thought to aim at some good, and for this reason the good has been declared to be that at which all things aim."
—Aristotle (13)

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